

Preparing Students for Their Future

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Presented at June 2005 Model Schools Conference

Education is integral to maintaining the cultural and structural stability of society. Society, whether it is viewed on a local, national, or global scale, is in a perpetual state of flux. An effective education system is one that is adaptable to change.

History provides a chain of examples of nations that assumed an elite status as a world power only to be replaced by the next up-and-comer. In the 1600s, the Spanish extended their political influence around the world; the 1700s was the century of Dutch imperialism; the British were dominant in the 1800s. The United States became the preeminent world power in the 1900s – a title which it retains to this day, albeit tenuously.

Based on the cyclical nature of such transitions and the frenetic pace at which society is changing at the global level, it is imperative for the U.S. to consider what actions we must take to remain a viable world presence. More and more, the American public points to education as the answer . . . or part of the problem. The Trends in International Math and Science Study (TIMSS) has shown American students to be quite average among the participating nations. The gap between technology and education continues to widen in America (Moore's Law is a sobering reminder of just how great the disparity is) because, as a nation of educators, we are not adapting to changes in society. Perhaps the added scrutiny on education in the end will help create the spark that ignites a renaissance for America – just as it did over a century ago when the U.S. was beginning its march to world prominence.

Looking back to the late 19th century, America was emerging from an agrarian society. The rural landscape was home to a large portion of the population – a vast majority of whom were self-employed or worked in small companies or on farms. When the Industrial Revolution hit and factories became the economic focus of the country, workers flocked to urban centers to seek employment. It was apparent that more leaders were required to keep pace with the changing climate of business, urban infrastructure, and cultural diversity. In 1893 the Committee of Ten was appointed to conceptualize how American schools should be structured to meet the demands of the time.

Generally, members of the agrarian society had required only a rudimentary level of education. In fact, most children completed their formal schooling by age 14 in order to begin working full-time. The change to an economy based on manufacturing required more young people be educated to assume leadership positions not only in industry, but in government, business, and communities as well. It was determined by the Committee of Ten to raise education standards and extend the years of schooling for a select 15 to 20 percent of young people to get them through the equivalent of today's high school level education.

The Committee's "select and sort" methodology was effective. The United States was the world leader in manufacturing throughout most of the twentieth century. As the century was coming to a close, however, it was apparent that the U.S. was not the economic monolith that it was earlier in the century. At the same time, society was experiencing another significant upheaval in form of the Information Age. Technology abounded around us, most people were employed in large companies, and we began to see a growing economic threat from other parts of the world. The 1983 report on education, *A Nation at Risk*, was thus born. Since 1983, the American schools have experienced compounded pressure from political and business leaders throughout the country to raise our academic standards across the board for all students. More recently states have seriously undertaken the implementation of the new standards and state assessments to be in compliance with the No Child Left Behind (NCLB) legislation. NCLB has required every district, school, superintendent, principal, and teacher in this country to look at new and

different ways of educating their students if they are to be successful in raising academic standards and student performance as defined by NCLB.

Whereas the Committee of Ten promoted a methodology of raising standards for a select few, the publication of *A Nation at Risk* accentuated the need to provide **all** students with an academically rigorous and relevant education. While this is the direction U.S. education needs to go, we are finding it easy to conceptualize change but difficult to implement it. Tinkering at the margins will not enable us to achieve our mission. Schools need to be restructured if they are serious about getting all students to the high standards necessary for them to compete and excel in the global society.

The Perfect Storm – Four Mega Trends

There are four major trends impacting the U.S., in general, and our students, in particular, which must be addressed to assure that our nation and our students are prepared to meet the challenges of the near and distant future. These four challenges are globalization, changing demographics, technology, and changing values and attitudes.

Globalization

September 11 is a date Americans will never forget. The vision and memory of planes crashing into the World Trade Center, the Pentagon, and the field near Shanksville, Pennsylvania have changed the way we view ourselves and the world around us. November 9, 1989, though not immediately recognizable as the date of another significant global event, it was the date the Berlin Wall came down, which symbolized the fall of communism in Eastern Europe. Since then, the Eastern Bloc nations of the former Soviet Union have entered the free enterprise system. And although India gained its independence from Great Britain in 1947, it wasn't until the late 1990s that the socialist leaning government was replaced by one deeply committed to a free enterprise system. More recently, China, one of the few remaining communist nations in the world, has emerged as a powerful participant in the global economic arena.

From the Eastern European nations and Russia to India and China, we have witnessed the rapid spread of capitalism to over half of the world's population in just 16 years. These nations have long envied the potential of what the free enterprise system can provide. Their goal is to emulate America by establishing a prosperous middle class. A century ago, the United States understood challenge and the enormous effort required to become a prosperous nation during a significant time of transition. Similarly, the Indians, Chinese, and Eastern Europeans recognize the energy and sacrifices required of them as individuals and realize the benefits of restructuring their countries from industrial to an information based societies. Current trends suggest that they are very willing to put forth the effort needed to attain a middle class standard of living for their societies. Americans, in general, and our youth, in particular, seem to believe it is their birthright to enjoy a middle class lifestyle and are lulled into a false sense of security and comfort. As a result, however, we lack the drive needed to match the aggressiveness of other nations in the global economy.

Globalization and rapid technological advancements are having dramatic effects on our lives as we experience the transition from an information-based society to one based upon bio and nanotechnology. As the pure information technologies that made companies such as Microsoft, Apple, and Cisco the world's most successful, new companies based on bio and nanotechnology will emerge. A main element in the transformation to an information-based society is the ease in which work moves to worker via digital and satellite information technologies. Suddenly a very large segment of the world's available workforce is competing for American jobs. Most MRI and CAT scans performed in American hospitals are analyzed in India rather than here at home. Hundreds of thousands of U.S. income tax forms this year were processed in India. Reuters recently moved 1,500 jobs in their research division to India. The U.K.'s "A Level" exams for college prep students, which contain complex essay questions, are now being graded in India because of their well trained, but inexpensive work force. In effect, information

technology has impacted the work place as much as e-mail and the World Wide Web have revolutionized the ways we conduct our personal business.

When you consider the ability to move work to worker in an age when the majority of jobs exist in the information sector, the fact that India, China, and Eastern Europe are competitive in the global economy is not surprising. It is a situation, however, that few Americans have been able to come to grips with and adapt to. The rapidity at which technology is changing is another challenge for the U.S. economy. Digital information systems are giving way to bio- and nanotechnologies. Unfortunately, America is not doing very well in recruiting young people to compete for jobs in these technology sectors. Consider the following:

- Bachelor's degrees in science and engineering make up sixty percent of the total degrees earned in China.
- Five percent of the degrees earned in the United States last year were in science and engineering.
- This year, China alone will graduate 350,000 engineers.
- By 2010 it is predicted that 90 percent of all the world's scientists and engineers will be in Asia.
- U.S. enrollment in science and engineering has dropped by 12 percent in the last five years.
- Nearly one-half of all U.S. enrollments in science, technology, engineering and mathematics are students who are non-U.S. citizens.
- In 1975, the United States ranked third in the world in the percentage of its students who were received degrees in science and engineering. Today we are 17th in the world.

In a world in which science and engineering will become the cornerstone of what is needed to know and be able to do in the 21st century, the U.S. is being outpaced dramatically by India, China, and Eastern Europe. The decline of U.S. enrollment in science and engineering combined with the fact that scientists and engineers will be even more coveted in the work force in the coming years places the U.S. at a great disadvantage as a nation. Continuance of these trends will result in severe human and economic consequences to our country.

Demographics

America is aging. As mentioned earlier, Americans at the turn of the 20th century typically took their first job at the age of 14 (today's child labor laws were put in place during the Great Depression to prevent young people from taking jobs away from adults). Today the average age at which an individual takes their first full time job is 18 years 7 months. The later age of beginning work is attributable to more time spent in the classroom. It is forecasted that the average start age of work will continue to be later and that by 2100 the average age of first time employment will be 21 years.

Now let us look at trends in the retirement age of Americans. In 1900, the typical employee worked until he or she died. The average life expectancy was 47 year. Life expectancies began to increase considerably, however, during the twentieth century. When Social Security was implemented in the 1930s, a retirement age was set at 65. This age was still well beyond the average life expectancy, so most people still worked until death. What the retirement age did accomplish, however, was to keep the American workforce fluid by continually pumping new employees into the jobs vacated by retirees as well as those who died. Today the average retirement age is down to 62 years but the average life expectancy is up to 77. Prolonging life was and continues to be a result of advancements in healthcare and medicine. Experts in geriatrics and genetics expect the increase in longevity we experienced during the last century to continue throughout this one. Even greater advancements and breakthroughs in healthcare

and pharmaceuticals are predicted to keep the average American alive to the unfathomable age of 107 by the year 2100.

What implications do these trends suggest? The only trend that remains somewhat static is the current average retirement age, which is actually trending down slightly. By the end of this century, if Americans do in fact live to be 107, begin work at 21, and retire at 62, the average citizen will have spent more time in retirement than they did working.

Compounding the impending strain on our nation's resources for senior citizens is a declining American birthrate. A zero-base population growth would equate to 2.1 births annually for every 100 women of childbearing age. In the time between the early 1900s until World War II, America averaged three births annually for every 100 women of childbearing age. Social Security was structured on a metric that assumed there would always be more young people than old. Immediately following World War II the baby boom happened. With 4.6 births for every 100 women of childbearing age, the birth rate greatly surpassed the death rate. Since 2000, however, the birthrate has dropped to an average of 1.4 births annually for every 100 women of childbearing age. With the baby boomers becoming eligible for Social Security in 2008, we will see a disproportionate 3:1 ratio of retirees to job market entries. Immigration growth will alleviate this considerably, but with that comes a new set of challenges such as an increasing number of limited English proficient students.

These demographic trends are the reason that Social Security and other retirement systems – including pension plans – are in jeopardy of collapse. It is a mathematical certainty that our nation cannot afford to allow these trends to continue without taking preventative action soon. In Illinois, for example, the state has promised 225,000 current and retired teachers \$51 billion in pensions. However, the state has only \$31 billion in its accounts to pay those pensions. Texas has recently informed its younger teachers that they will need to work longer before they can collect their pension, which will be based on averaging their last five years of teaching rather than their last three. These situations are increasingly common. Something must be done, as the nation simply cannot afford to wait and hope for the best any longer, especially with other major challenges on the horizon.

There is also an enormous challenge facing us in the area of Medicare. In 2004, nine percent of the federal budget was spent on Medicare; in 2020 it will be 25 percent. In 2040, 50 percent of the federal budget will be spent on Medicare. Medicare and social security by 2040 will more than wipe out the entire federal budget with no resources available to provide to schools, national defense, etc.

These factors helped to convince Senator Edward Kennedy to sponsor No Child Left Behind and President Bush to embrace it. The looming civil rights and economic crises we face are far beyond anything the nation has experienced in the past. We need to understand and accept that No Child Left Behind is not just a senseless piece of legislation imposed upon educators, but legislation that is crucial to our nation's security and well-being.

Technology

Many of us can remember the first mainframe computers . . . how they filled an entire room, required four technicians to operate, and were fed data by inserting punch cards in them. The earliest mainframes had a grand total of eight megabytes of storage capacity. In 1976, the personal computer (PC) first hit the market. The natural progression of technology has armed us with the more portable laptop computers we enjoy today. Gradually now the laptop is being replaced by the personal digitized assistant (PDA) or what is commonly referred to as the hand held computer. The PDA now allows us to access e-mail and the Internet from anywhere we travel. These devices have so much more speed and capacity than the early mainframes or even the early PCs that we must pause and wonder how we survived such primitive technologies. In the very near future, Smart Personal Object Technology (SPOT) will become the newest fad. SPOT will be integrated in our watches, and essentially function as a PC. With this technology a user would project the image of both a screen and keyboard from the SPOT unit onto a tabletop or piece of paper and work as if using a regular PC and keyboard. As technology continues to get smaller, it becomes more and more an extension of our being.

The transformation of technology from PCs to PDAs to cell phones to watches is possible thanks to the advancement of nanotechnology. Nanotechnology uses the atom as the fundamental building block for the development of technology. Nanotech companies are now manufacturing computer chips that are 1/1000 the width of a human hair. These computer chips have as much computing power as traditional silicon chips. Soon we will see a quantum leap in computing capacity as we move towards the total integration of information-, nano-, and biotechnology. Completed in 2003, the Human Genome Project (HGP) was a 13-year project that culminated in the successful mapping of human DNA. This monumental project triggered an explosion in research and of understanding how life works. By integrating the various areas of technology, researchers will have the ability to manipulate and develop life systems in manner very much like software systems were developed. Genes are pieces of information. Genes can, therefore, be engineered to become an information system . . . like a computer. The rate at which biotechnologies are developing is impressive. Moore's Law quantifies the processing power of a computer chip as doubling every 18 months. Bio/nanotechnology-based information systems will double in processing power every 27 months.

Here are a few examples of dynamic breakthroughs achieved recently in bio- and nano-science. Biotech scientists at Odontis Ltd., formed by King's College, London, have developed a technique in which stem cells are taken from a patient, treated and cultured in a laboratory, then re-implanted in the patient's jaw under the gum at the site of a missing or extracted tooth. The "seed" will then grow into a fully formed, live tooth. At the University of Louisville, a team of doctors believes that they are ready to perform the world's first facial transplantation procedure. This radical form of surgery may provide hope to severely disfigured burn victims and cancer patients.

One of the most exciting and revolutionary discoveries being developed is *in vivo* (Latin for 'within the living') technology. Studies are being performed on mice involving the placement of nanoparticle probes on semiconductor quantum dots into the circulatory system. The probes seek out cancerous cells in tumors, accumulate at the site of the tumor, and become luminescent under imaging. This delineates the boundaries of a tumor and also shows a doctor if it has spread. The nanoparticle probes are multifunctional and have the potential of killing cancerous cells. Of all the cancer treatments being developed, *in vivo* therapy may be the one that finally provides a cure for cancer.

Although *in vivo* technology may revolutionize cancer treatment, it is not really new. Insertion of a pacemaker into a human heart is technically an *in vivo* procedure, but not on a nano scale. More recently, the Vagus Nerve Stimulator (VNS) has been used to treat epilepsy sufferers. The VNS is a pacemaker sized device attached to a wire that connects to the vagus nerve. Stimulation of the vagus nerve can stop seizures in some patients or reduce the intensity and frequency of seizures in others.

In the sphere of bioinformatics, the VeriChip is one of the fastest growing technologies available. The chip is a secure radio frequency identification device (RFID) approximately the size of a grain of rice that can be embedded with a unique identification number and critical medical data about the wearer. Requiring only local anesthesia and a tiny incision, it can be inserted in an outpatient setting. The data on the chip is retrieved through an external scanner. It works by allowing a small amount of radio frequency energy to pass through the skin and "energize" the dormant VeriChip.

The world today is an exciting one. Unfortunately, America at present is not positioned to maintain the level of leadership it enjoyed in the past. Other nations have made great strides in a short period of time of readying themselves for the future. America has been unable to keep pace with the changes going on in the world and is finding it more difficult to compete in the global economy.

China, unsurprisingly, is the world leader in clothes, shoes, and furniture manufacturing. They also lead the world in the production of consumer electronics and computers, meaning they have taken over a very significant sector of the technology industry. China is now positioned to become the world leader in bio- and nano-technology research and development. They understand the competition they face in America, Europe, India, and the other Pacific Rim nations, but the numbers are in their favor. As mentioned earlier, 60 percent of all bachelor's degrees in China are awarded in the areas of science and engineering and 90 percent of the world's scientists and engineers will work in Asia by 2010. The fact that it costs five times as much in America to employ a scientist or engineer than in China only

exacerbates the problem that the U.S. faces. A highly skilled population willing to work for low wages is a concept that seems foreign to the U.S. value system.

Advancements in biotechnology now make possible a new method of selecting and sorting young people. Knowledge of one's genetic makeup can identify an individual's learning styles and aptitudes, and whether he or she is an inductive or deductive reasoner. Some Asian nations believe that they can use the genetic composition of students to place them in education programs that best suit their DNA. In America, however, this process would be considered a civil liberties violation if made mandatory.

One sector of the U.S. population that really understands the dynamics of competition at the national and global level and the challenges America faces is the business community. The economic trends became evident to them in the early 1980s with the dramatic decline in the number of unskilled jobs. Jobs that were once routine and sequential have been eliminated or replaced by technology that speeds production and reduces costs. Furthermore, the ease with which information can be shared allows businesses to outsource work overseas with a high-quality, low-cost return. Medium wage, high skill jobs are the standard for today's global economy. Unfortunately the high cost of American labor coupled with the vast amount of money required to support an aging population makes outsourcing very desirable to American companies.

Changing Values and Attitudes

Each generation acquires a different set of values and expectations than the ones before. Neil Howe and William Strauss, respected authors and experts in the field of generation studies, believe that every generation attempts to reverse what it perceives as the worst characteristics of its older generations, and to fill the role being vacated by the dying generation. Howe and Strauss contend that this cyclical process (four generations to complete a cycle) has been proven over the course of history. If this is true, today's students have very large shoes to fill because history has marked them as successors to the World War II-winning G.I.s, the ones labeled by Tom Brokaw as the "Greatest Generation."

The G.I. Generation was born in the first quarter of the 20th century. They experienced the Roaring Twenties and the Great Depression and fought in World War II. They were great risk takers and team players. They were responsible in large part for the restructuring of the American education, business, and government systems. This generation valued a high school diploma and considered it sufficient for success in life.

The G.I. Generation gave birth to the Silent Generation--labeled as such because they were expected to stay out of the way while their parents were busy fighting the Germans and Japanese. They grew up feeling they were born too late to do great deeds and felt it was their responsibility to protect the status quo. This generation placed value on graduating from high school.

Immediately following World War II and up to the mid-1960s the Baby Boomers were born. Generally, this generation was self-absorbed and rebelled against the cultural sterility they felt that they grew up with. They were deeply into their individual needs and, to an extent, self-absorbed. Many failed to see the importance of a high school diploma, but got one anyway. Some began to see the value of a college education as necessary to success. Baby Boomers were culture creators, and left an indelible mark on American society.

Baby Boomers spawned Generation X, a reactive and nomadic lot. The self-absorption of their parents made them feel under-protected as children and felt they had to raise themselves. As a result, Gen Xers grew up quickly as a generation and were responsible for the dot.com boom of the 1990s. They were pragmatic about the value of a high school diploma and did not view it as sufficient for success.

Howe and Strauss have named the next generation "Millennials." They are mostly the children of Generation X and are the ones filling K-12 classrooms today. The baby boomers were content to entrust their children's education to the schools. Gen Xers do the opposite. They want to be involved in every aspect of their children's education; much to the chagrin of many teachers and the students themselves. They are what Howe and Strauss call "helicopter parents." Their willingness to challenge school policy and the techniques and decisions of teachers has placed additional pressure on the American education

system. Interestingly enough, public opinion polls of parents of Millennials show that they generally support a push for new standards and are not nearly as opposed to tough testing requirements as are educators.

Millennials are not like their parents or grandparents, though. In their book, *Millennials Rising – the Next Great Generation*, Howe and Strauss make the point that “millennial attitudes and behaviors represent a sharp break from Generation X, and are running exactly counter to trends launched by the Boomers.” They are respectful, civic minded, collaborative, less likely to smoke or drink, and are good students. Both NAEP and TIMSS show a steady increase in student performance, especially among lower grades. Of all the trends discussed to this point, the increasing proficiency of students is by far the most positive.

Millennials are the largest group of young spenders in history, but not much of what they spend is their own money. This generation is growing up in an era of unparalleled affluence and many of their acquisitions (e.g. X-Boxes, DVDs and Game Boys) are gifts or co-purchases provided by parents or grandparents. Whereas China, India, and Eastern European countries are committed to establishing a middle class, Millennials have known no other scenario. They likely believe a middle class lifestyle is a birthright.

Conclusion

The four mega-trends (global, demographic, technological and cultural issues) facing America today cannot be ignored. The factors described give credence and forewarning of a quietly approaching perfect storm that threatens the middle class American lifestyle.

History is cyclical in the sense that there are good times as well as bad and each will pass. The United States has weathered numerous crises in its relatively brief history. When the perfect storm hits this country, we need to be up to the task once again. The students in schools today are a good source of hope and our nation’s most valuable resource. We must empower them to weather the storm.

Resources

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